Answers for 11.6

For use with pages 765–768

11.6 Skill Practice

1. F

2. $\angle AFE$

3. 6.8 units

4. 5.5 units

5. Divide 360° by the number of sides n of the polygon.

6. 36°

7. 20°

8. 15°

9. 51.4°

10. 45°

11. 22.5°

12. 67.5°

13. 135°

14. about 62.4 square units

15. about 289.2 square units

16. about 20.9 square units

17. 7.5 is not the measure of a side length, it is the measure of the base of the triangle, it needs to be doubled to become the measure of the side length;

$A \approx \frac{1}{2}(13)(6)(15) =$

585 square units.

18. B

19. about 122.5 units, about 1131.4 square units

20. about 29.8 units, about 61.1 square units

21. 63 units, about 294.3 square units

22. Yes; about 24.7 square units; since a nonagon has 9 sides, $18 \div 9$ tells you that each side is 2 units long, and $\frac{360}{9}$ tells you that the measure of the central angle is 40°. A right triangle can be constructed with a base of 1 unit and angle of 20° opposite the base; $\tan 20 = \frac{1}{a}$ allows us to find the apothem and then the area is $\frac{1}{2}\left(\frac{1}{\tan 20}\right)(18) \approx 24.7$ square units.

23. apothem, side length; special right triangles or trigonometry; 392 square units

24. apothem; Pythagorean Theorem, special right triangles or trigonometry about 259.8 square units

25. side length; Pythagorean Theorem or trigonometry; about 204.9 square units

26. about 223.8 square units

27. about 79.6 square units

28. about 117.9 square units

29. about 1.4 square units

30. about 59.4 square units

31. True; since the radius is the same, the circle around the n-gons is the same but more and more of the circle is covered the larger n is.

32. True; the radius represents the hypotenuse of a right triangle with the apothem as a leg, therefore, the apothem must always be less than the radius.

33. False; the radius can be equal to the side length as it is in a hexagon.

34. $A = \frac{1}{2}bh = \frac{1}{2}\left(2 \cdot \frac{s\sqrt{3}}{2}\right)\left(\frac{s}{2}\right) = \frac{s^2\sqrt{3}}{4}$

$A = \frac{1}{2}a \cdot ns = \frac{1}{2}\left(\frac{s\sqrt{3}}{6}\right)(3s) =$

$\frac{3s^2\sqrt{3}}{12} = \frac{s^2\sqrt{3}}{4}$

35. shaded area = area of hexagon − area of pentagon + area of square − area of triangle; 92 square units

11.6 Problem Solving

36. a. $4\sqrt{3}$ in.

b. 48 in., 166 in.^{2}

37. 1.2 cm, about 4.8 cm^2; about 1.6 cm^2

47. 25/81

48. $\frac{2}{51}$

38. Predictions may vary.

a. about132.7 in.^{2}

b. 135 in.^{2}

c. about 139.4 in.^{2}

39. 15.5 in.^{2}; 43.0 in.^{2}

40. a. Check students' work.

b. about 2.6 in.^{2}, about 0.54 in.^{2}

c. *Sample answer:* Draw $\overline{AB}$ with length 1 in. Open compass to 1 inch and draw a circle with that radius, continue with this setting and mark off equal parts on the circle. Connect 2 consecutive points with the center of the circle.

41. $\frac{360}{9} = 60$, so the central angle is 60°. All of the triangles are of the same side length r, and therefore all six triangles have a vertex at the center with central angle 60° and side lengths r.

42. Method 1: $A = \frac{1}{2}aP =$

$\frac{1}{2}\sqrt{3}(12) = 6\sqrt{3}$

Method 2: 6(Area of a central triangle) $= 6\left(\frac{1}{2}bh\right) =$

$6\left(\frac{1}{2} \cdot 2 \cdot \sqrt{3}\right) = 6\sqrt{3};$

Method 3: $A = \frac{1}{2}a \cdot ns =$

$\frac{1}{2}(\sqrt{3})(6)(2) = 6\sqrt{3};$

Method 4: $A = 2$(Area of trapezoid) $= 2\left(\frac{1}{2}h(b_1 + b_2)\right) =$

$2\left(\frac{1}{2}\sqrt{3}(4 + 2)\right) = 6\sqrt{3}.$

43. Because P is both the incenter and the circumcenter of $\triangle ABC$ and letting E be the midpoint of $\overline{AB}$, you can show that $\overline{BD}$ and $\overline{CE}$ are both medians of $\triangle ABC$ and they intersect at P. By the Concurrency of Medians of a Triangle Theorem, $BP = \frac{2}{3}BD$ and $CP = \frac{2}{3}CE$. Using algebra, show that $2PD = CP$.

44. a. 0.52 cm

b. About 0.2 cm^2; $a = 0.26$ cm and when you construct a right triangle with a as the height and a 30° angle measure between a and the hypotenuse, you can use a tangent ratio to give you the base of the triangle to be 0.15, which means the side of a hexagon is 0.30. So the area of a cell is $\frac{1}{2}(0.26)(6 \cdot 0.3)$, or about 0.23 square centimeters.

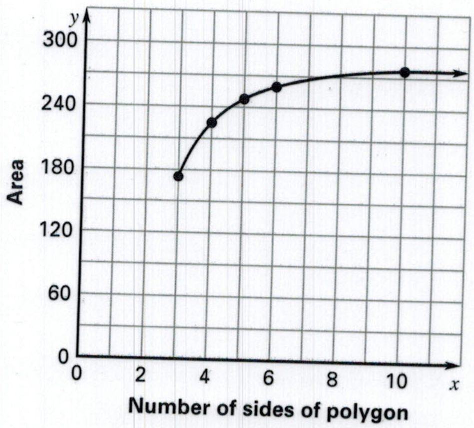
c. 23.4 cm^2; 0.23 dm^2

d. Solve the proportion $\frac{1 \text{ cell}}{0.52 \text{ cm}} = \frac{x \text{ cells}}{10 \text{ cm}}$ and find that there are about 19.2 cells per decimeter.

45. a. About 173.2 cm^2; square: about 225 cm^2, pentagon: about 247.7 cm^2, hexagon: about 259.9 cm^2, decagon: about 277cm^2; the area is increasing with each larger polygon.

b. about 286.2 cm^2, about 286.4 cm^2

c.



circle; about 286.5 cm^2

46. $A =$

$$r^2 n\left[\tan\left(\frac{180°}{n}\right) - \cos\left(\frac{180°}{n}\right)\sin\left(\frac{180°}{n}\right)\right]$$

11.6 Mixed Review

47. $\frac{25}{81}$

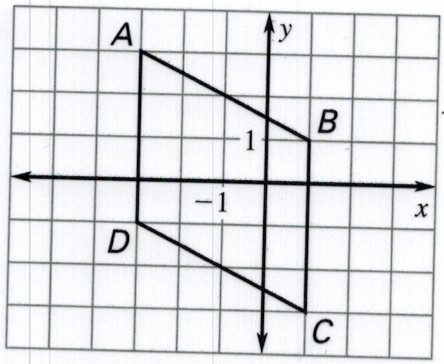
48. $\frac{2}{51}$

49. $\frac{1}{2}$

50. $\frac{2}{7}$

51. $\frac{4}{5}$

52.



parallelogram